USGS National Water Quality Assessment Program

Meeting the Nation's Needs for Water-Quality Information in the Next Decade

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Program Goals

- ✓ **Status**—"What is the current quality of the Nation's surface water and groundwater?"
- ✓ **Trends**—"Is water quality getting better or worse?"
- ✓ **Understanding**—"What are the natural and human factors that control water quality?"

Important Features of NAWQA

- **Operates perennially on a decadal time-scale**
  - **Cycle 1 (1991-2001)**
  - **Cycle 2 (2002-2012)**
  - **Cycle 3 (2013-2023)**
- **Consistent sampling and analytical methods**
- **Targeted design (based on land and water use)**
- **Multiple scales**
- **Multidisciplinary—hydrology, chemistry, ecology**
- **Multi-level communication strategy**

51 NAWQA Study Areas, 1991 - 2001

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Transition from Cycle 1 to Cycle 2

Study units to….

Regional assessments

Status to….

Trends and Understanding

Monitoring to….

Monitoring and Modeling

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Priorities for Cycle 3

Nutrients

Contaminants

Sediment

Streamflow Alteration

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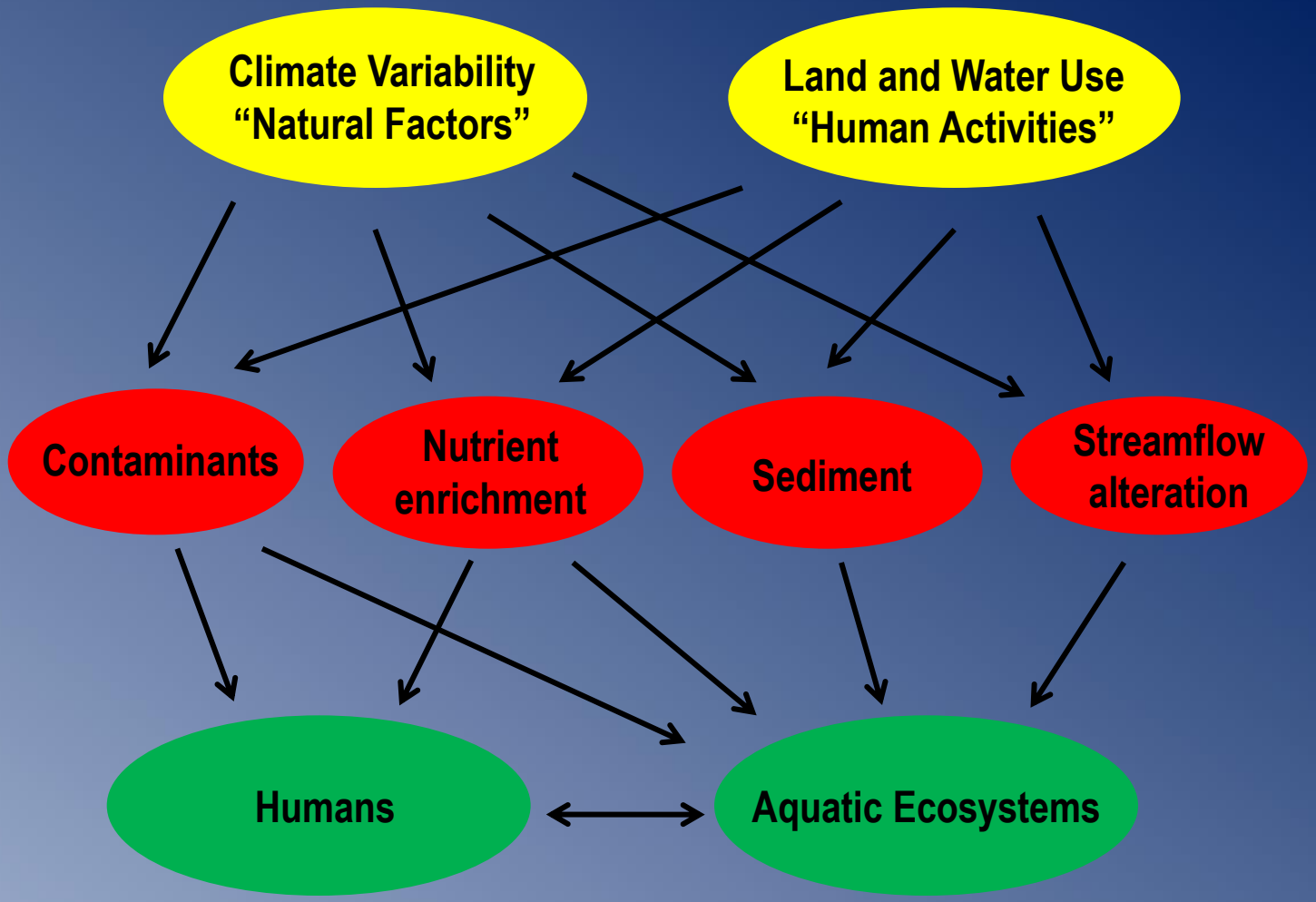
Cycle 3 Design Framework



Study Components

1. **National Fixed Site Network** 100 streams monitored for long-term trends
2. **Regional Stream Quality Assessments** Intensive single season studies
3. **Principle Aquifer Surveys** Groundwater quality
4. **Integrated Watershed Studies** GW-SW relations in a few settings
5. **Forecasting** Models of surface- and ground-water quality and effects on aquatic ecology

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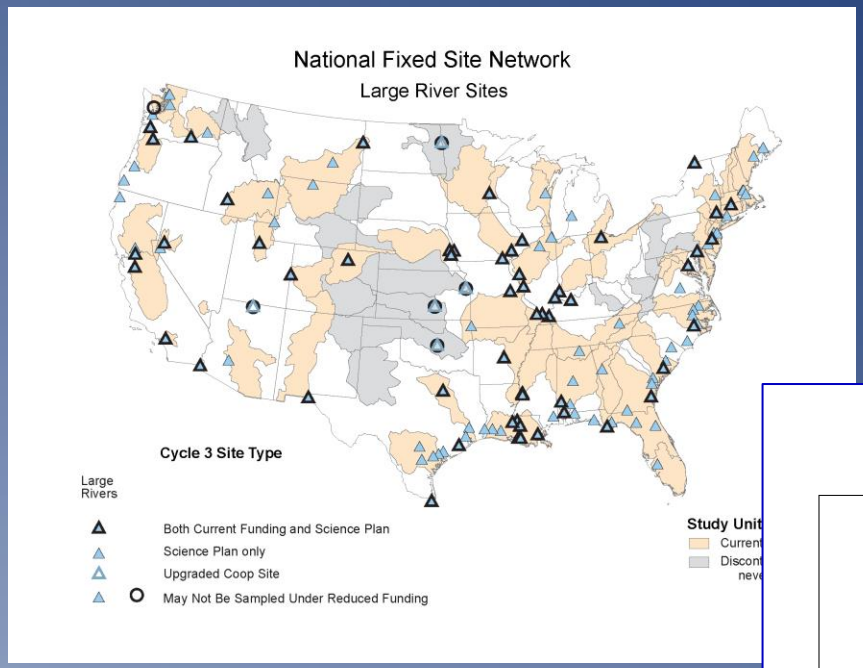
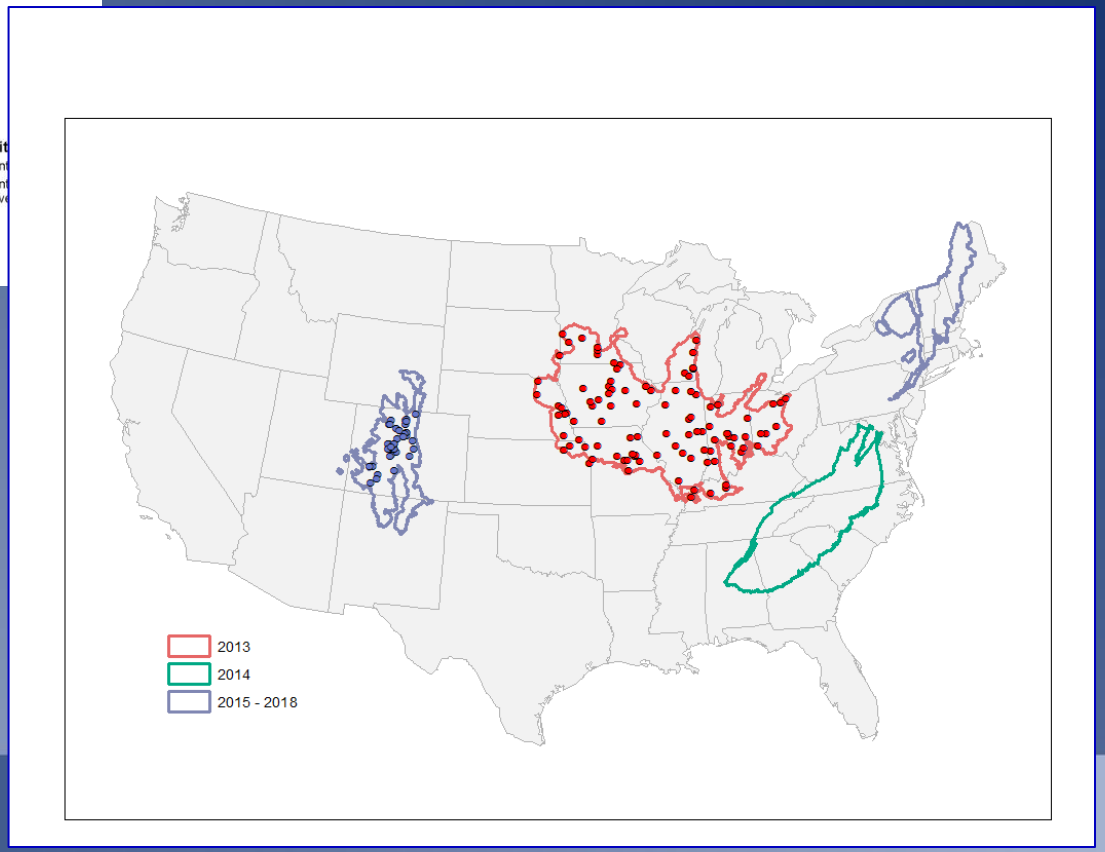
Scales of Investigation for SW



National Fixed Site Network (NFSN)



Regional Stream Quality Assessments (RSQA)

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Regional Stream Quality Assessments

- Status of the stream quality in the region
- Relations between stressors and ecological condition
- Relations between environmental setting and stream quality
- Develop models of stressors and ecological responses regionally

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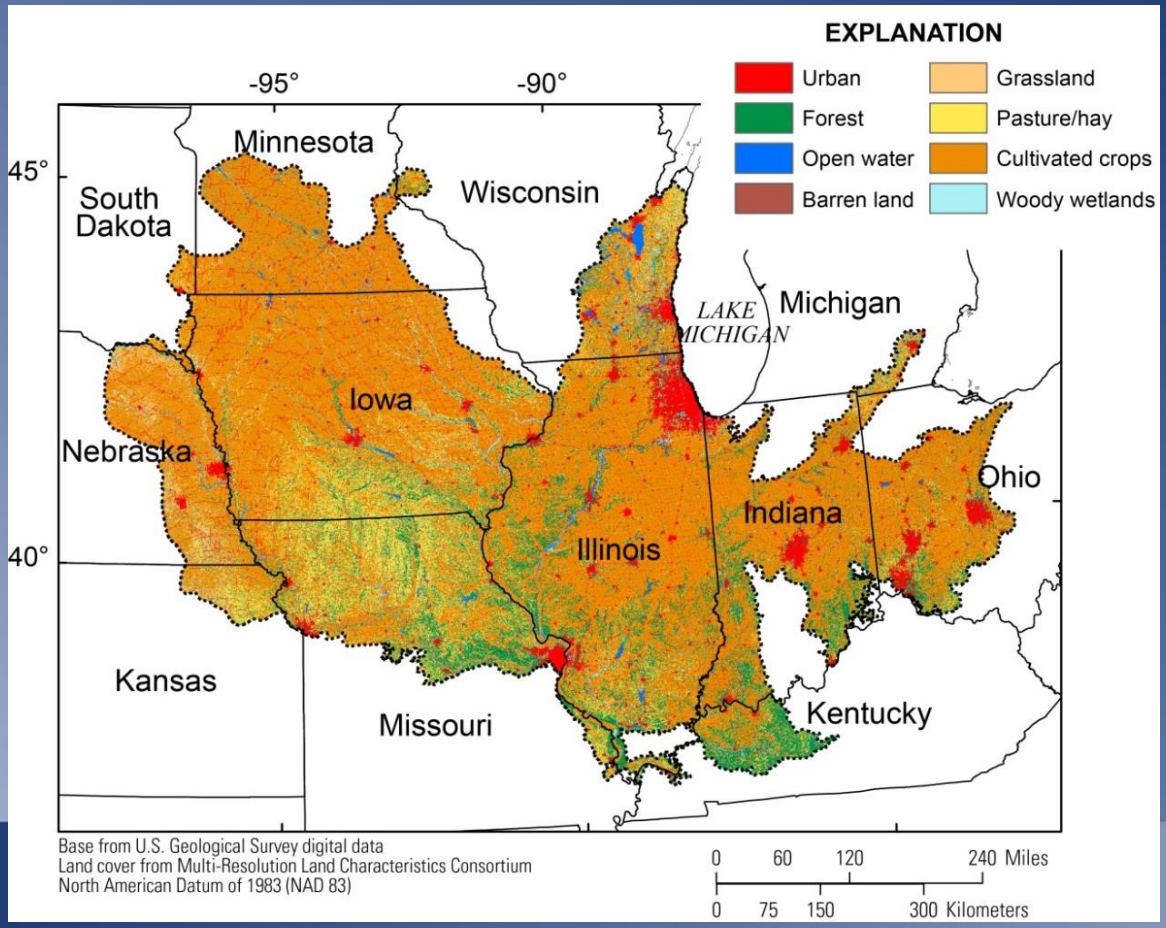
Midwest Stream Quality Assessment

- USGS National Water Quality Assessment
- USEPA Office of Pesticides Program
- USEPA National Rivers and Streams Assessment



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MSQA components

- Geographic distribution and seasonal changes in stressors
  - Contaminants, nutrients, and sediment in water seasonally
  - Contaminants in sediment
  - Contaminants in time-integrating samplers
  - Toxicity of sediment and water
- Ecological conditions
  - Ecological sampling at all sites and regional estimates of condition
- Modeling/prediction

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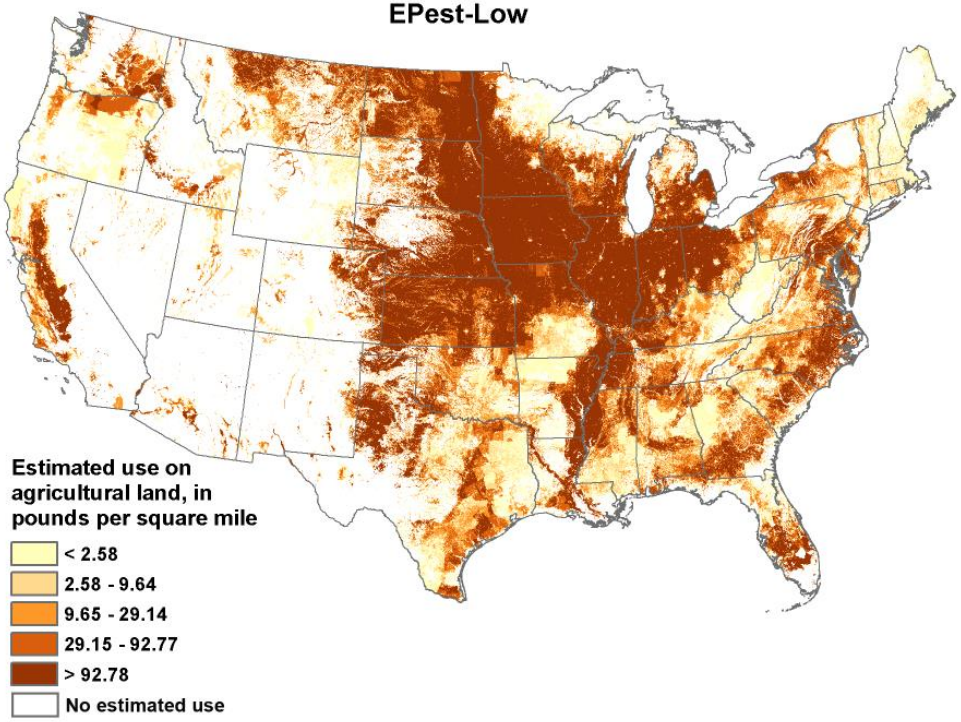
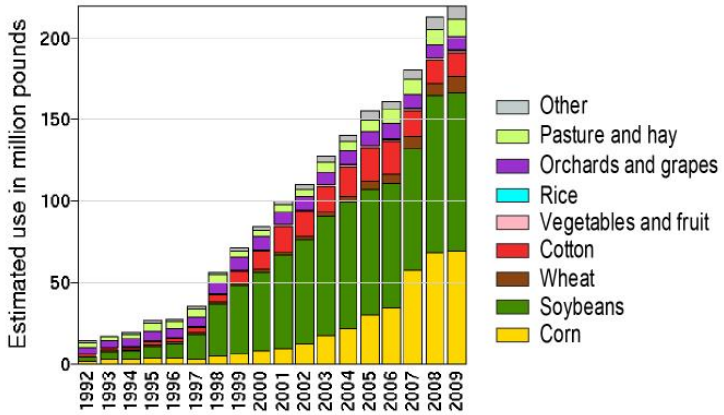
Estimated Agricultural Use for Glyphosate , 2009

EPest-Low



Use by Year and Crop



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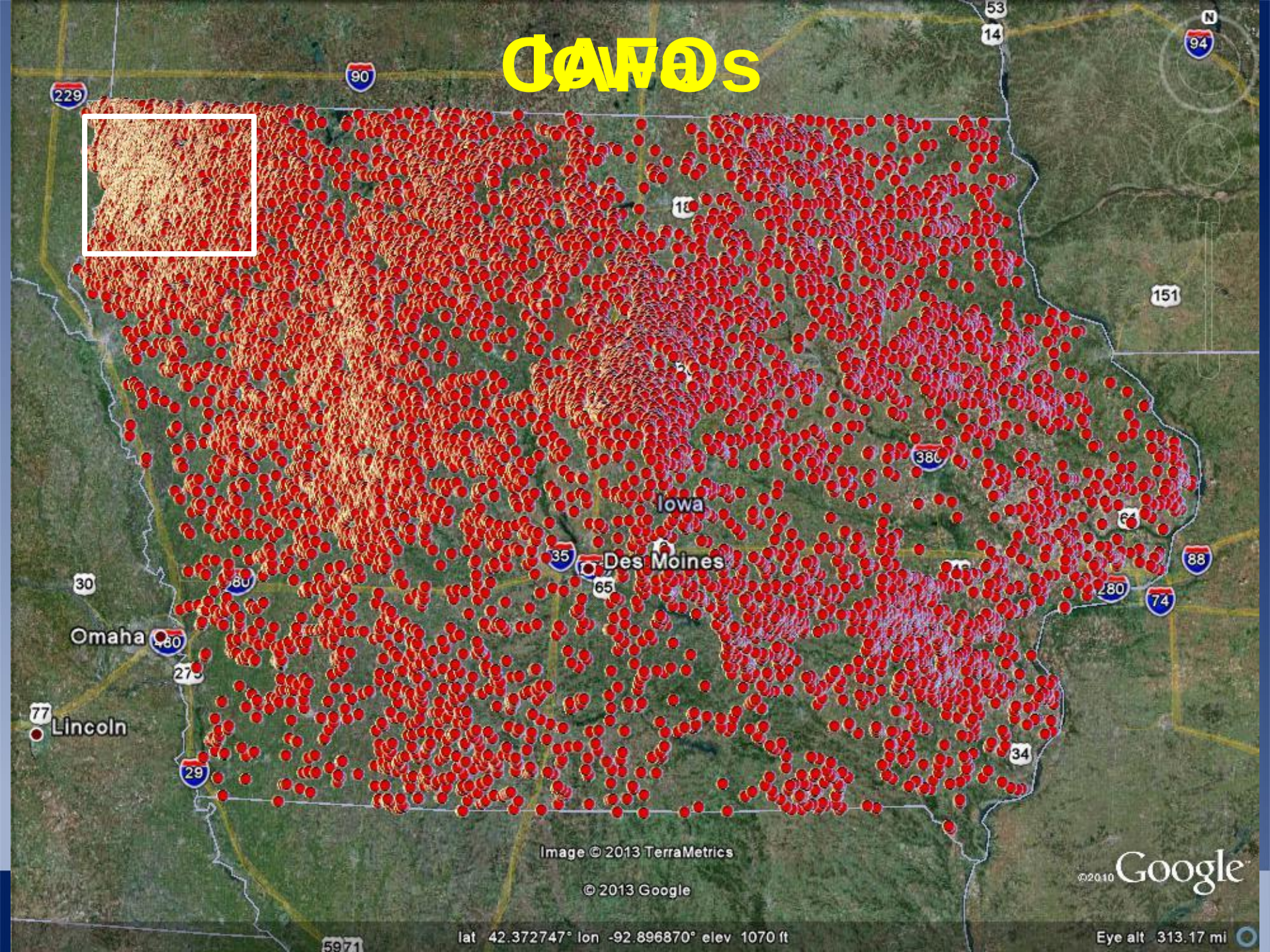
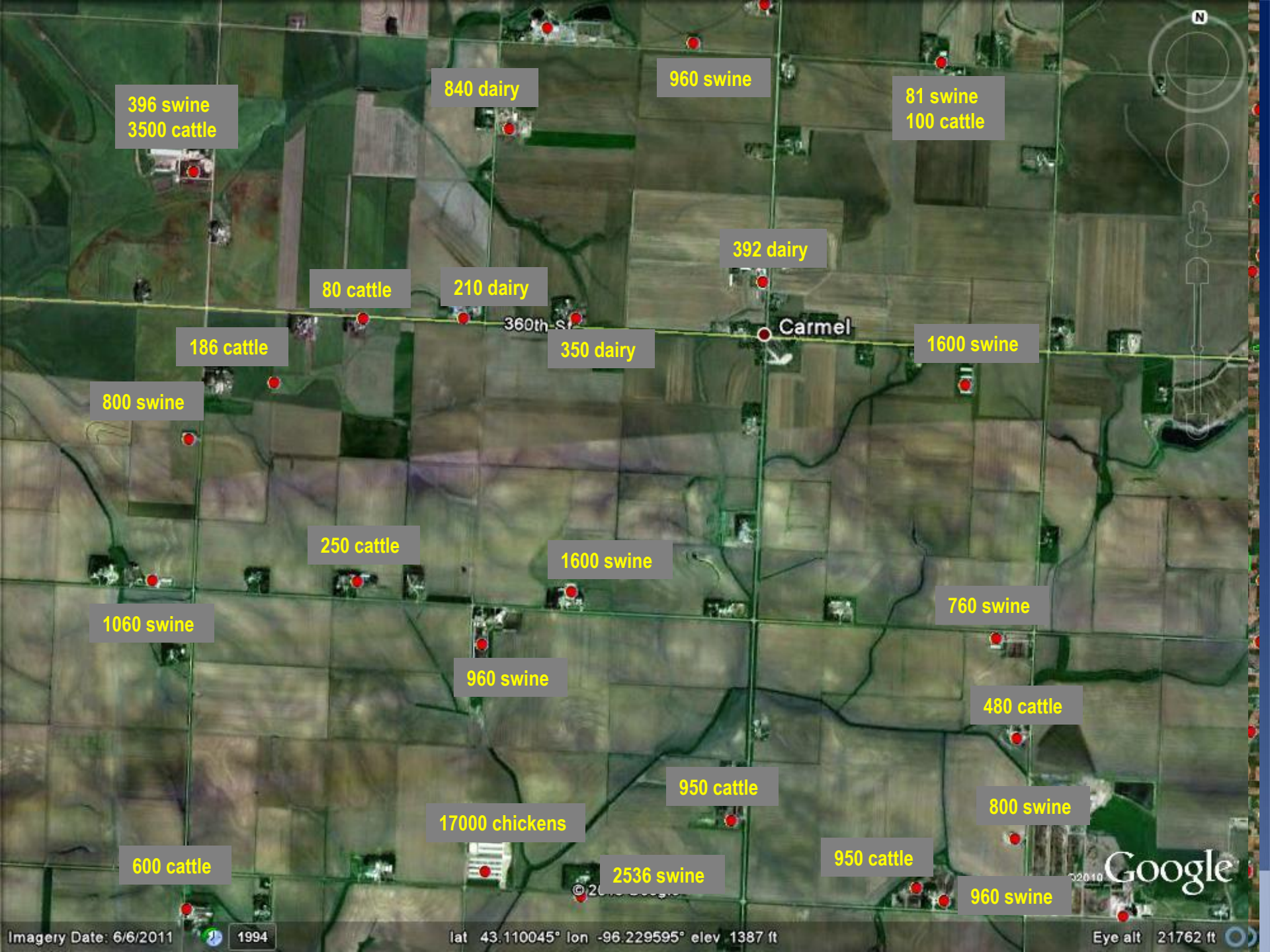
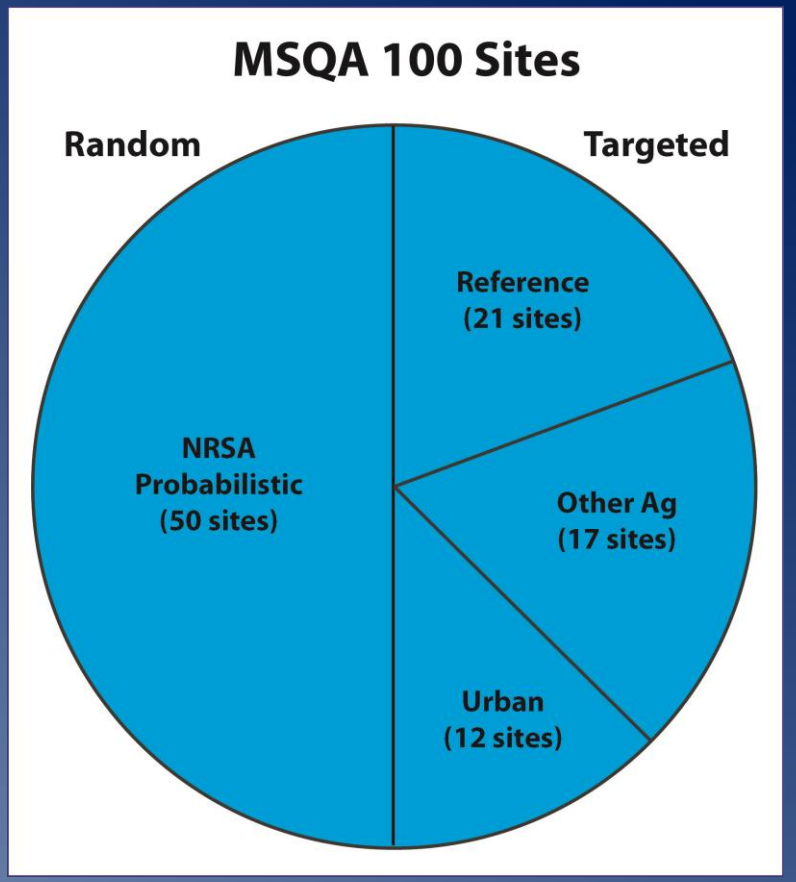
VALMETAL


CAFOs
Iowa
Des Moines
Omaha
Lincoln
Image © 2013 TerraMetrics
© 2013 Google
©2010 Google
lat 42.372747° lon -92.896870° elev 1070 ft
Eye alt 313.17 mi


396 swine
3500 cattle
840 dairy
960 swine
81 swine
100 cattle
392 dairy
80 cattle
210 dairy
360th St
Carmel
186 cattle
350 dairy
1600 swine
800 swine
250 cattle
1600 swine
760 swine
1060 swine
960 swine
480 cattle
950 cattle
800 swine
17000 chickens
600 cattle
2536 swine
950 cattle
960 swine
Google
Imagery Date: 6/6/2011
1994
lat 43.110045° lon -96.229595° elev 1387 ft
Eye alt 21762 ft

Sites

- Match our sampling to NRSA's first 50 random sites
- Fill out stressor gradients with 50 targeted sites:
  - Reference – 21 sites
  - Urban – 12 sites
  - Trend and high-priority sites – 17 sites



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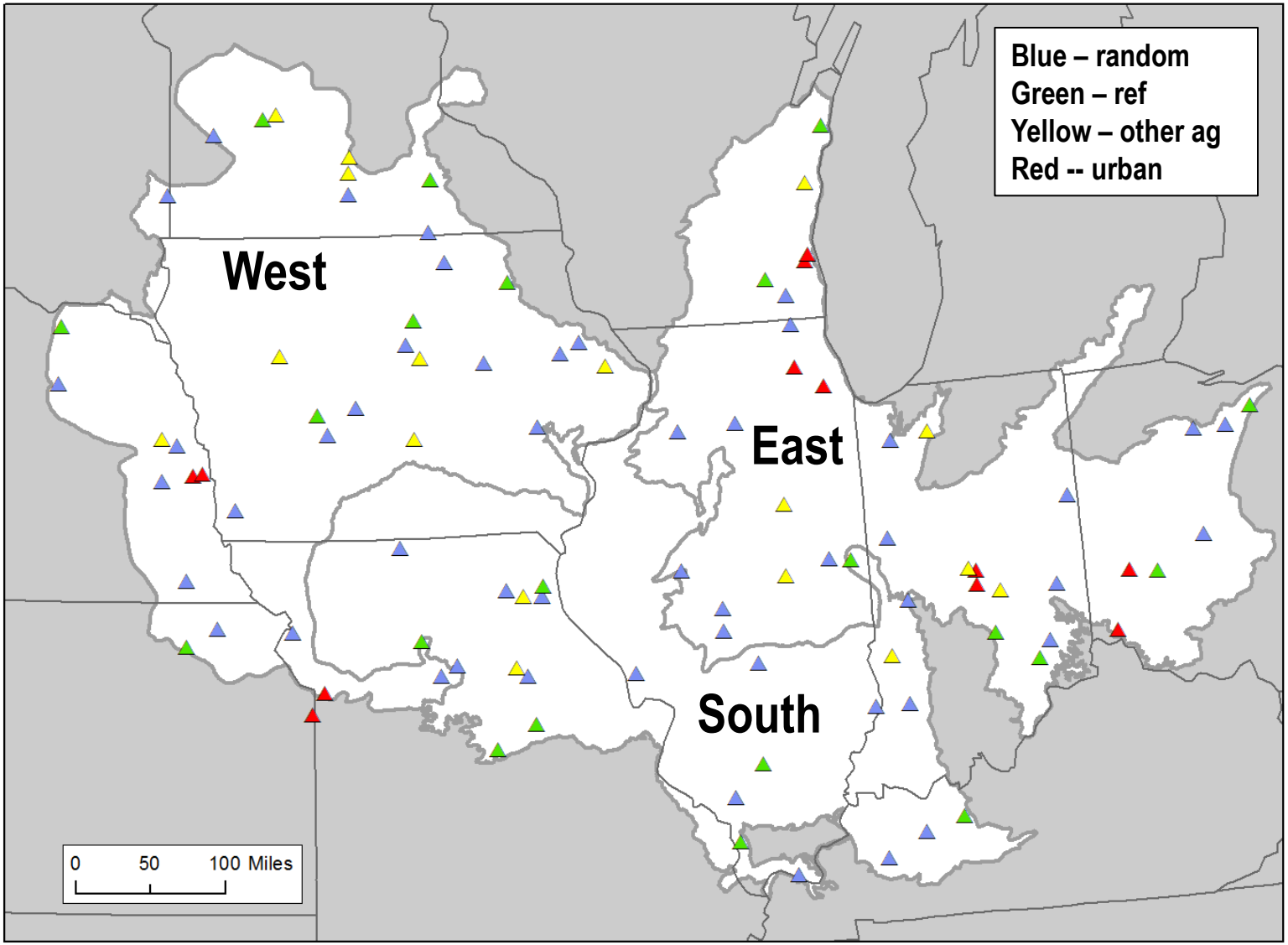
MSQA sites


Blue – random
Green – ref
Yellow – other ag
Red -- urban
West
East
South
0
50
100 Miles

Sampling at all 100 sites

All 12 visits, water samples:
- Major ions or Cl/SO4
- Nutrients
- Suspended sediment conc.
- Pesticides
- Glyphosate (IA)
- 17β-estradiol (IA)

Three visits, Chlorophyll a, phytoplankton

Final visit, sediment samples:
- Major and trace elements
- OC and radionuclides
- Pesticides (CUPs)
- Toxicity testing

Final visit, Ecological survey

POSIS, deployed for final 6 weeks, all samples analyzed
- Current-use pesticides

SPMD, deployed for final 6 weeks but not all will be analyzed

27 intensive sites: 12 ag, 12 urb, 3 ref

Final visit, sediment samples:
- Halogenated compounds
- PAHs and other SVOCs

Final visit, tissue samples:
- Halogenated compounds
- Current-use pesticides

Every other visit, water sample
- Hormones (NWQL)
- Glyphosate (KSWSC)

SPMDs analyzed
- Halogenated compounds
- PAHs and other SVOCs

10 sites: Pankow/tox 5 ag, 5 urban

Pankow daily water samplers and weekly composite (4 ag, 3 urban)
- EPA to analyze for pesticides
- NWQL weekly composite split

Every other visit whole water (10 sites)
- Water toxicity (CERC)
- Suspended and filtered CUPs

71 sites: NRSA Hg

Every other visit, grab water sample: MeHg and THg

Final visit, fish tissue plug for Hg by NRSA

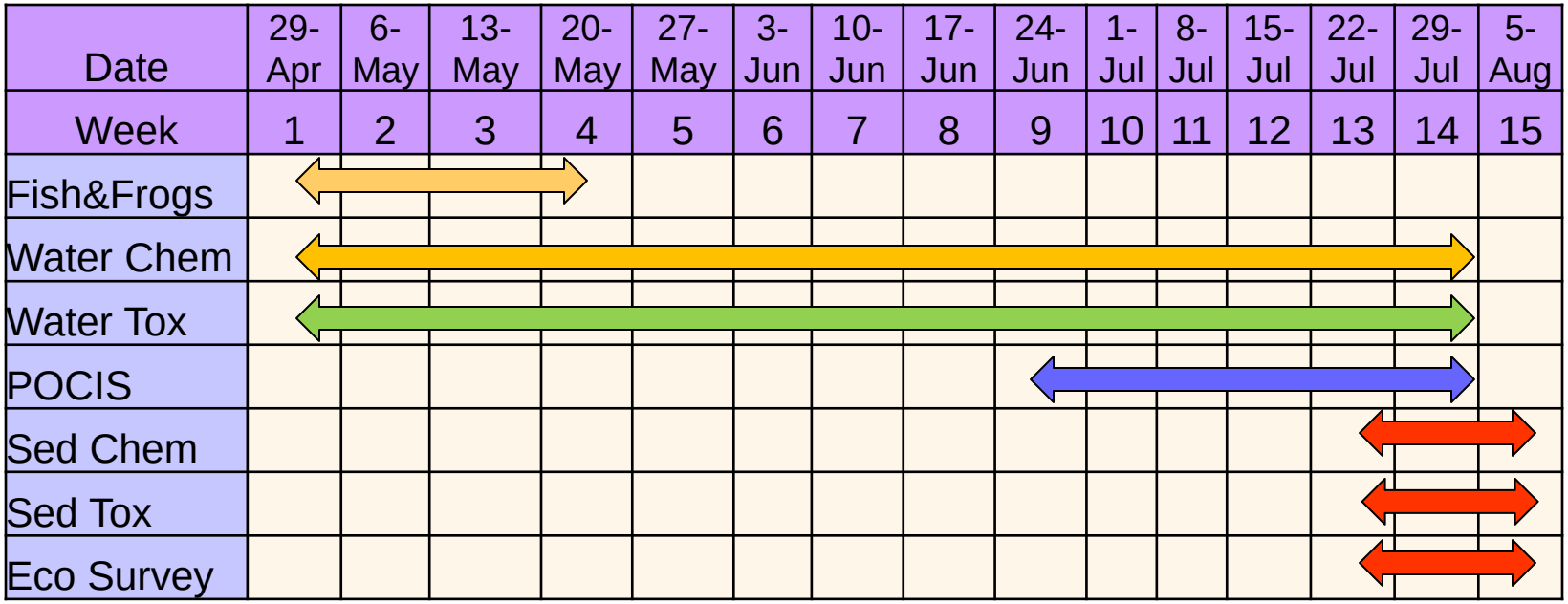
6 sites: continuous

Continuous DO, N, etc. monitors
- Additional periphyton

8 sites: caged fish/frog

Caged fish and frogs, CERC
- reproductive endpoints and biomarkers

Sampling time line



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Expected outcomes

- At 100 sites, current use pesticides
  - Occurrence in streams seasonally across gradients in land use and pesticide use
  - Co-occurrence in water, sediment, and POCIS
  - Relations to aquatic communities
  - Relations to sediment toxicity
- At 27 intensive sites
  - Hydrophobic/legacy pesticides in sediment, SPMDs, and fish tissues
  - Glyphosate (GC/MS/MS)

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Expected outcomes, cont.

- At 10 water tox sites
  - Relations between pesticides in water and suspended sediment to whole-water toxicity
- At 7 pankow sites
  - Daily record of pesticide occurrence; evaluation of periodic sampling options/limitations
- At 8 fish/frog sites
  - Effects of complex mixtures of pesticides and other stressors on reproduction and health

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Expected outcomes, cont.

- Modeling/prediction
  - New generation WARP models for pesticides and nutrients
  - Current use pesticides in sediment
  - Relative risk to ecological communities
  - Ecological models
  - Inform future monitoring
  - Basis for management decisions

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Des Moines Water Works

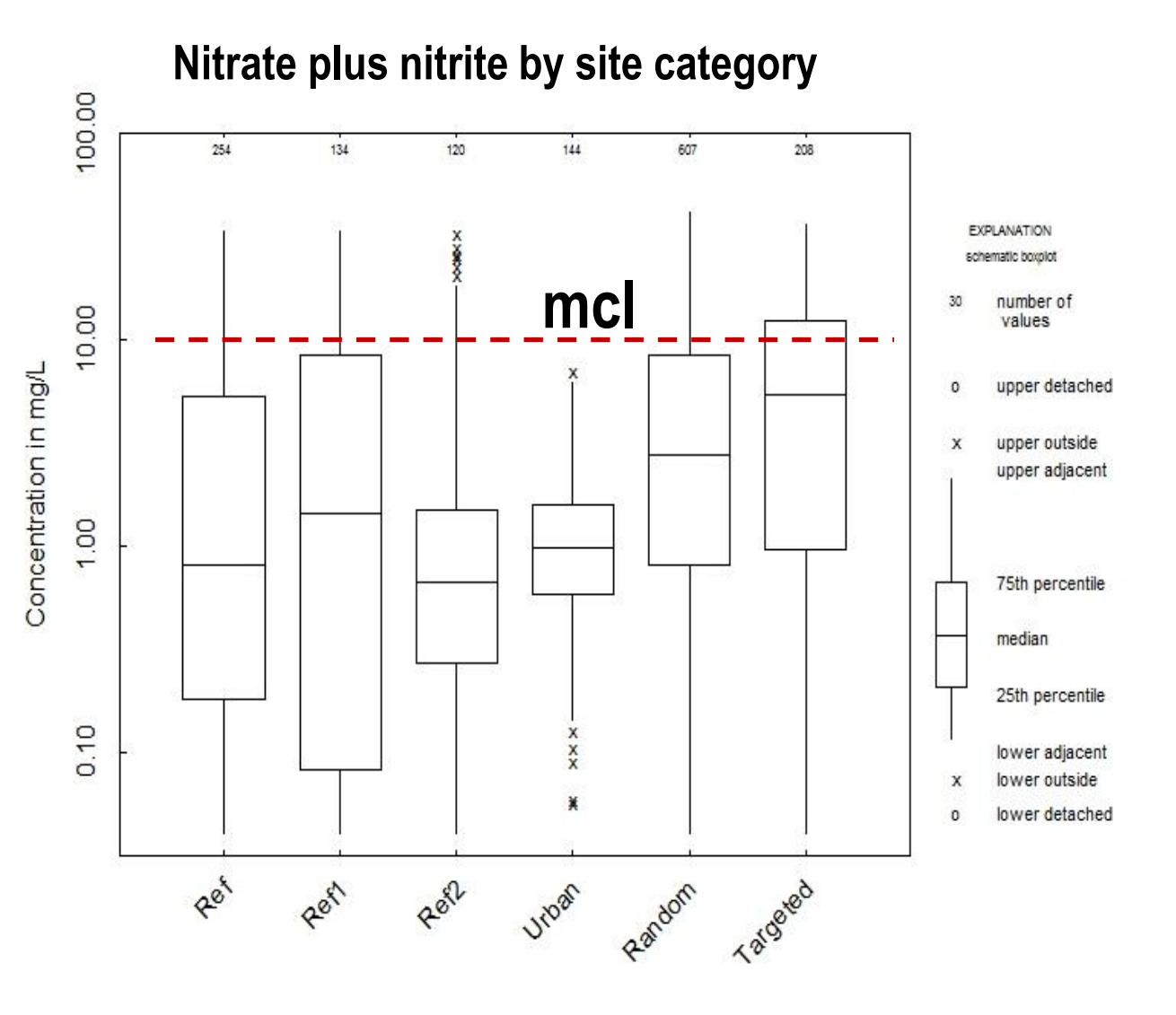
News Release

Historic Nitrate Levels in Des Moines Water Works' Source Water

Tuesday, May 28, 2013

Nitrate concentrations continue to remain exceptionally high in both the Raccoon and Des Moines Rivers. Through extensive and expensive water treatment, Des Moines Water Works' finished drinking water is currently under the Environmental Protection Agency's (EPA) maximum contaminant level (MCL) of 10 milligrams per liter (mg/l) and is safe for drinking.

Preliminary nitrogen data



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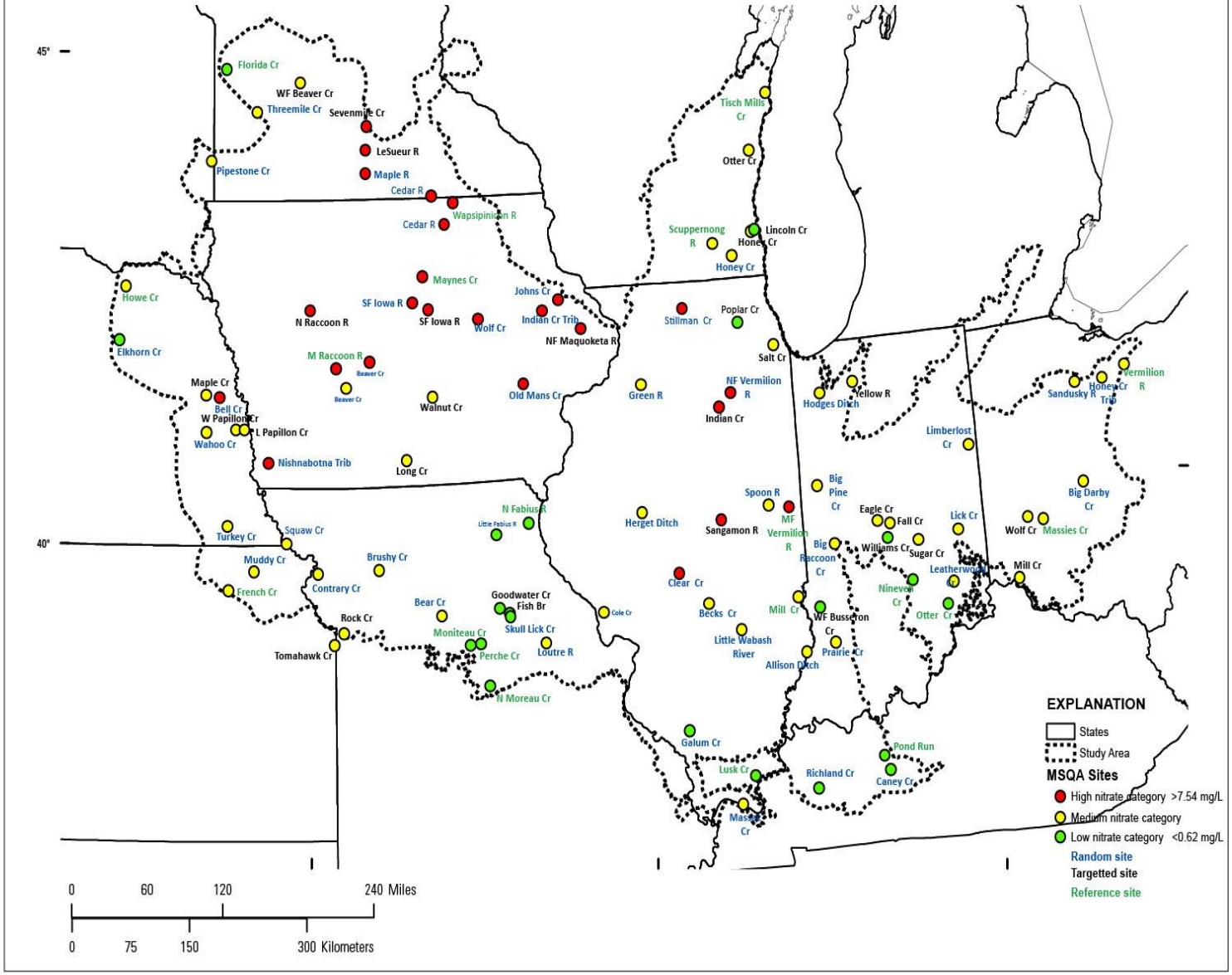
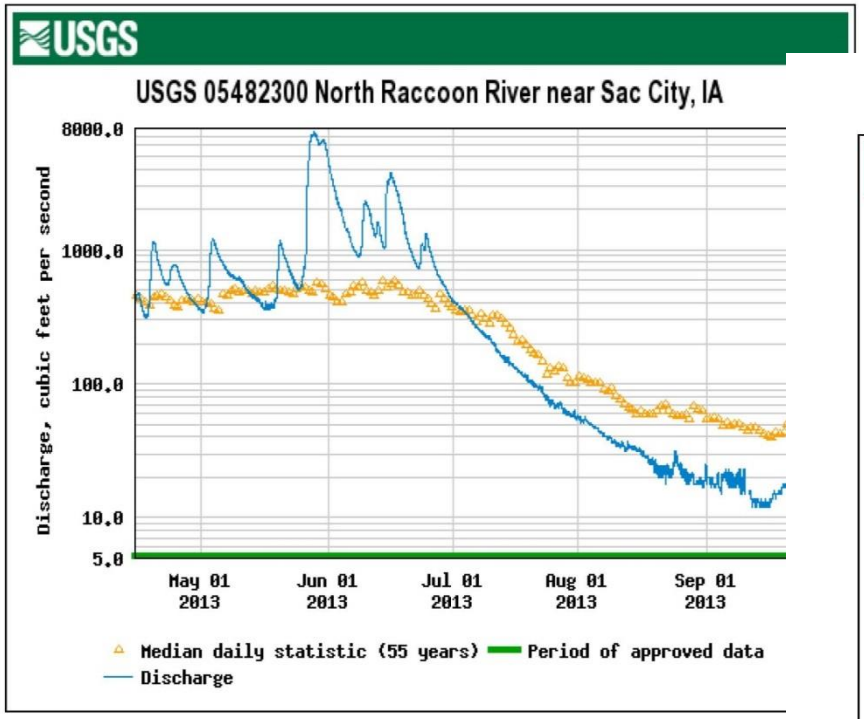
Spatially the highest nitrate concentrations were in IA, IL, MN



High nitrate related to high spring streamflow and fall drought conditions



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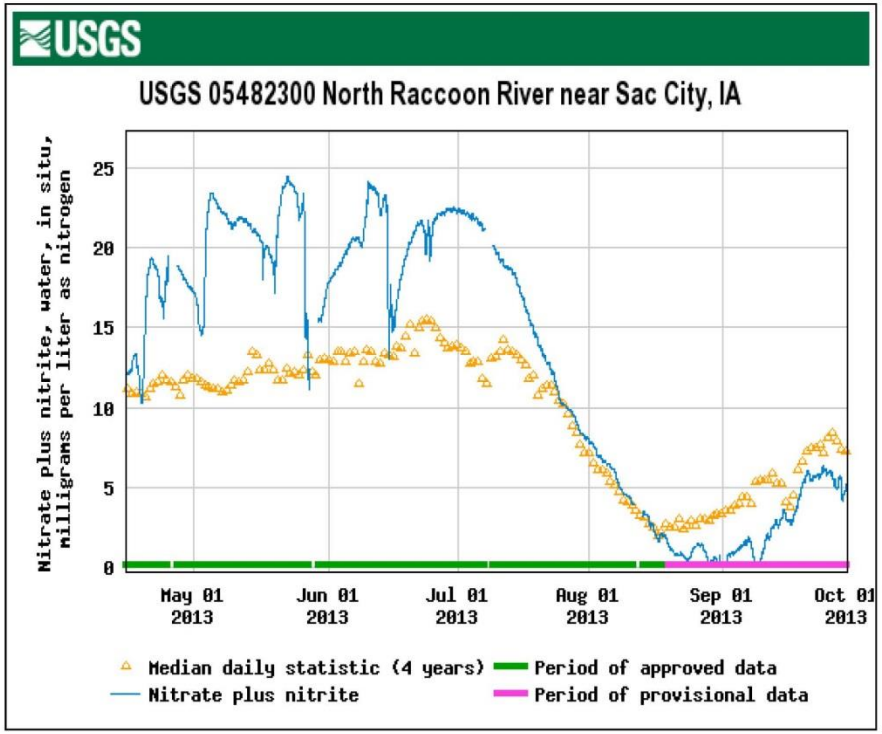

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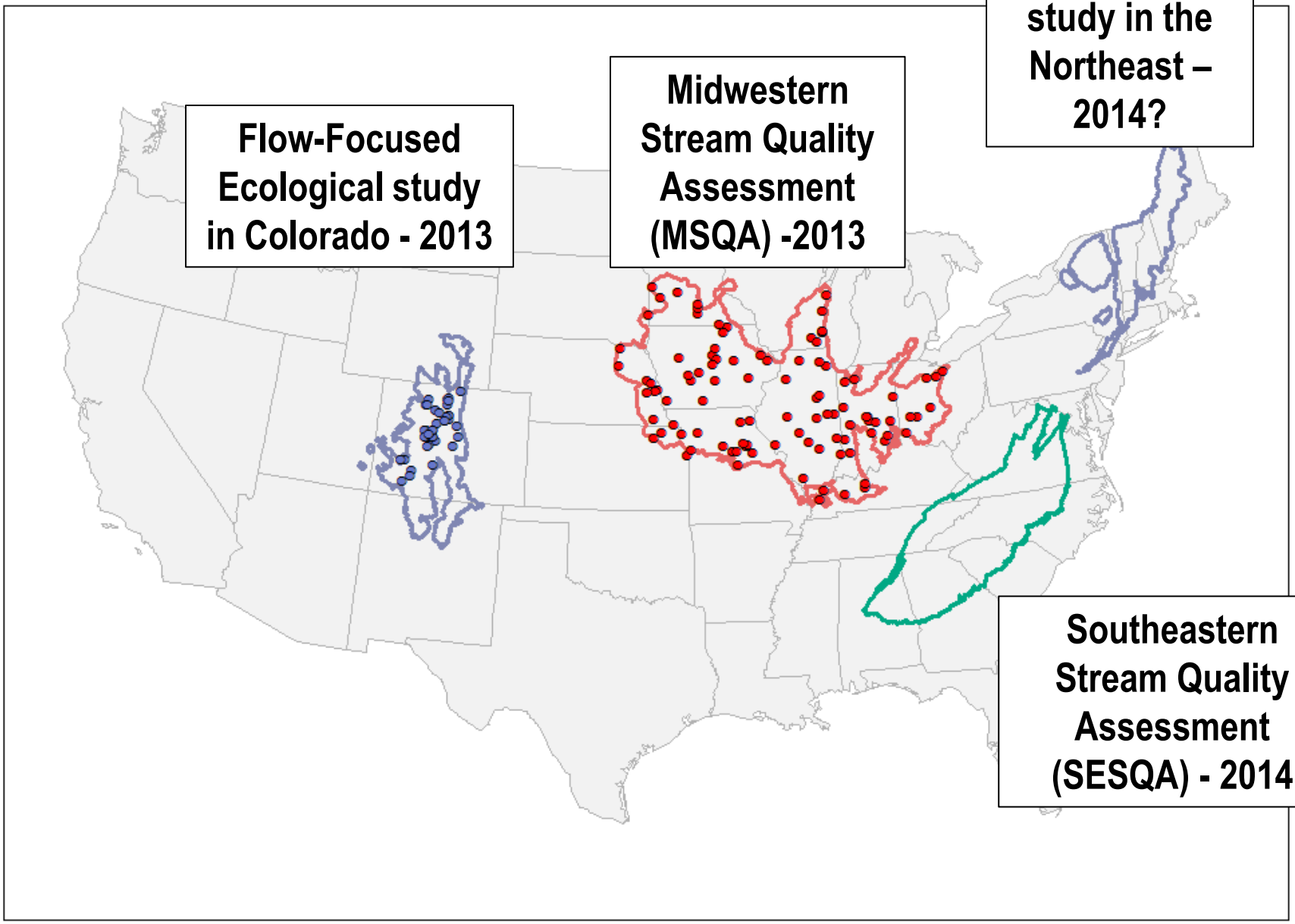
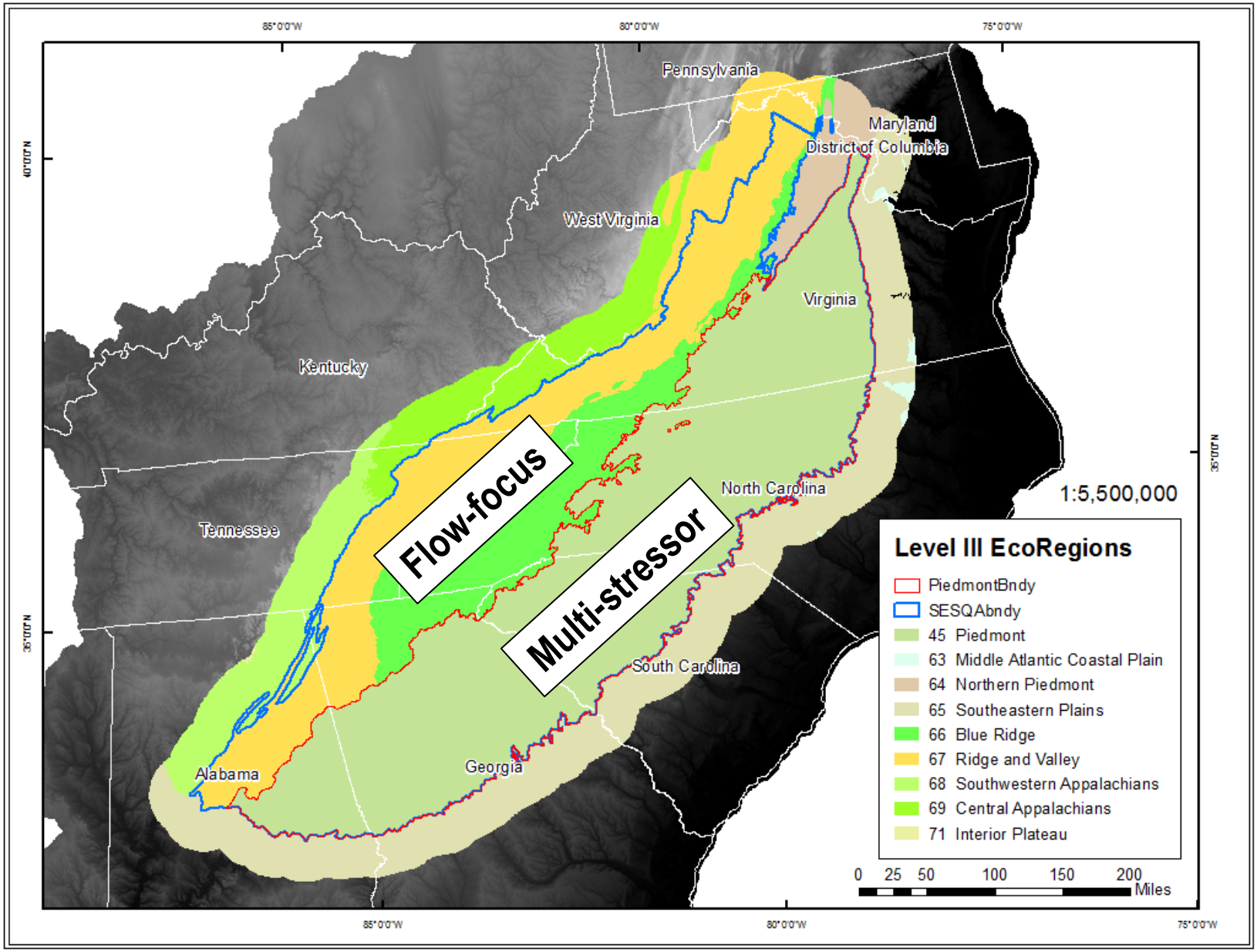
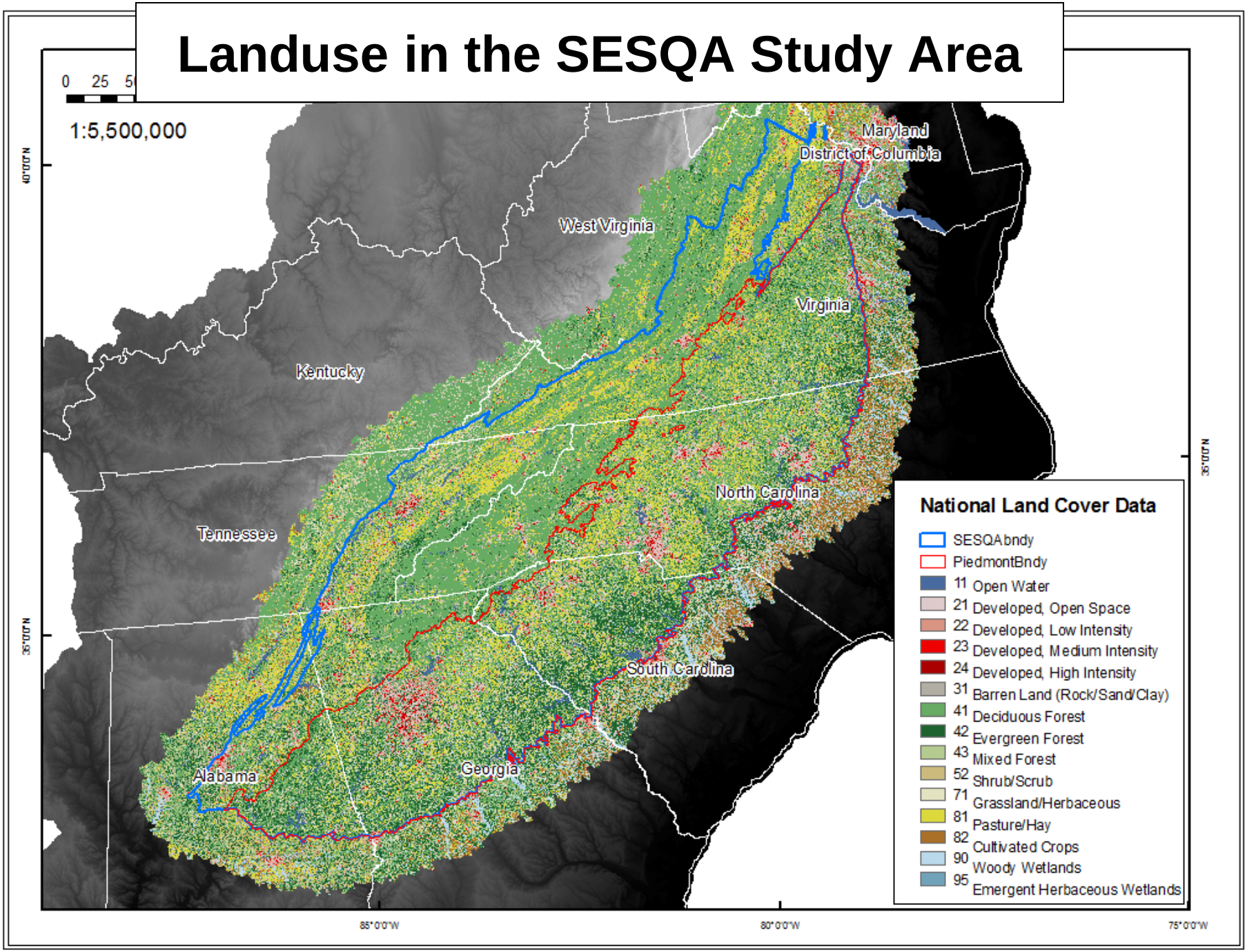
Current Studies



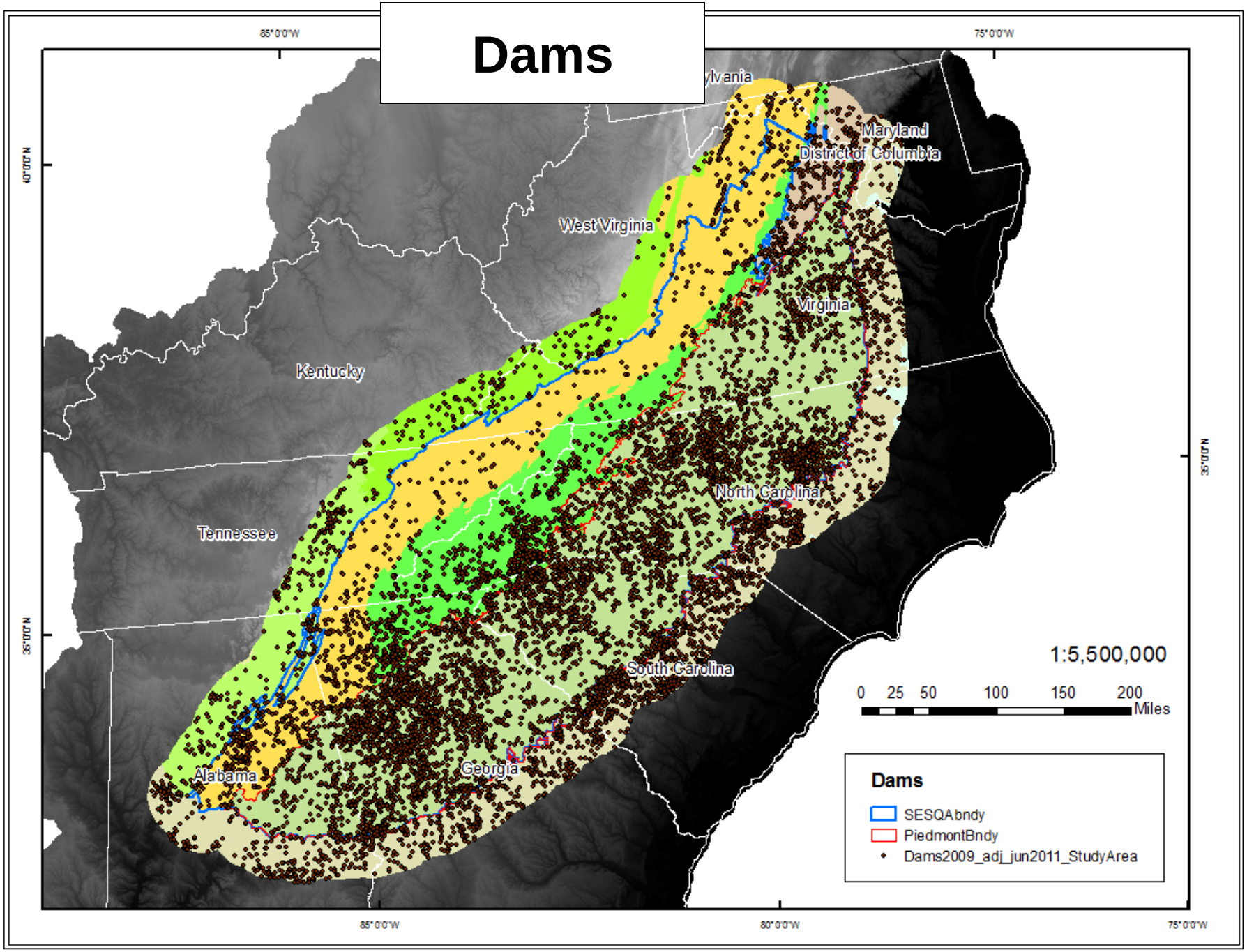
SESQA Study Area



Landuse in the SESQA Study Area



Dams


85°0'0"W
75°0'0"W
40°0'0"N
35°0'0"N
Maryland
District of Columbia
West Virginia
Virginia
Kentucky
North Carolina
Tennessee
South Carolina
Georgia
Alabama
1:5,500,000
0 25 50 100 150 200
Miles
Dams
SESQAbndy
PiedmontBndy
Dams2009_adj_jun2011_StudyArea

Information and Contacts

NAWQA – USGS

http://water.usgs.gov/nawqa

OPP – USEPA

http://www.epa.gov/pesticides/

NRSA – USEPA

http://water.epa.gov/type/rsl/monitoring/riverssurvey/index.cfm

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